Growth and manipulation of 2D van der Waals magnets

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Van der Waals (vdW) magnets provide an exciting opportunity for exploring two-dimensional (2D) magnetism for next generation scientific and technological advances. While previously realized in 3D ultrathin films where the magnetism is stabilized via substrate-assisted magnetic anisotropy, recent reports have shown intrinsic ferromagnetism at low temperatures (<60 K) in isolated μm-sized flakes mechanically exfoliated from a bulk single-crystal down to a single-atomic layer. This opens up the possibility to truly study magnetism in free-standing 2D layers without direct effects from the underlying substrate and being intrinsically susceptible to surface effects such as atomic adsorbates, charge doping, and proximity-induced phenomena. This talk will examine a set of materials grown by molecular beam epitaxy (MBE) such as $MnSe_2$ and VSe_2, as well as their subsequent characterization. This will be followed by some discussion about tuning the magnetic ordering temperature in other 2D magnetic materials such as $Fe_{3-x}GeTe_2$ by high pressure and proximity to electrically-charged regions on ferroelectric $BaTiO_3$ substrates.

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